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SENATE ENVIRONMENTAL QUALITY COMMITTEE
JERRY HILL, CHAIR

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ROOM 3191

Flame Retardants and Technical Bulletin 117-2013

BACKGROUND

California Technical Bulletin 117

The Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation (bureau), under the California Department of Consumer Affairs, enforces the Home Furnishings and Thermal Insulation Act (Act).

A fundamental requirement of the Act is the licensing and inspection of businesses that manufacture and sell upholstered furniture, bedding and thermal insulation to ensure consumer safety.

The bureau also enforces other regulations required by the Act, such as health and safety standards, product labeling requirements and truth in advertising laws.

In 1975, California adopted Technical Bulletin 117 (TB 117), requiring upholstered furniture sold to California consumers to be flame resistant, making it less likely to ignite rapidly, and, if ignited, less likely to burn quickly or sustain burning. The bureau published and enforces TB 117.

TB 117 is a mandatory standard. It is both an open flame test and a smoldering cigarette test for the component materials used to make residential upholstered furniture which is to be sold in the State of California. In this test, each upholstery component except the covering fabric is time exposed to either an open flame or a smoldering cigarette in a defined test chamber, and the propagation of the open flame or the cigarette char length is measured to a specific specification criteria contained in TB 117. All upholstered furniture components except frames must comply with this test procedure and criteria.

Because this standard requires each component to meet the flammability standard, furniture manufacturers meet TB 117 with additive halogenated organic flame retardants. Although no other U.S. states have a similar standard, because California has such a large market, many manufacturers meet TB 117 in products that they distribute across the United States.

Recent reviews of flame retardant chemicals by both the federal and California governments have found that the use these chemicals for fire protection in compliance with TB 117 provide no "meaningful" protection.

In the past, advocates for the flame retardant industry have cited a study from the National Bureau of Standards indicating that a room filled with flame-retarded products (a polyurethane foam-padded chair and several other objects, including cabinetry and electronics) offered a 15-fold greater time window for occupants to escape the room than a similar room free of flame retardants.

However, critics of this position, including the lead author of this study, Vyentis Babrauskas, argue that the levels of flame retardant used in that 1988 study are much higher than the levels required by TB 117 and the levels used broadly in the United States in upholstered furniture do not provide meaningful fire protection.

Several studies in the 1980s tested ignition in whole pieces of furniture with different upholstery and filling types, including different flame retardant formulations. In particular, they looked at maximum heat release and time to maximum heat release, two key indicators of fire danger. These studies found that the type of fabric covering had a large influence on ease of ignition, that cotton fillings were much less flammable than polyurethane foam fillings, and that an interliner material substantially reduced the ease of ignition. They also found that although some flame retardant formulations decreased the ease of ignition, the most basic formulation that met TB 117 had very little effect. In one of the studies, foam fillings that met TB 117 had equivalent ignition times as the same foam fillings without flame retardants.

In 2012, the Chair of the Federal Consumer Product Safety Commission testified to Congress that "the fire-retardant foams did not offer a practically significant greater level of open flame safety than the untreated foams" and California's bureau made similar findings.

<u>TB 117-2013</u>

In 2012, Governor Brown directed the bureau to review California's four-decade-old flammability standards and recommend changes to reduce toxic flame retardants while continuing to ensure fire safety. Governor Brown stated, "Toxic flame retardants are found in everything from high chairs to couches and a growing body of

evidence suggests that these chemicals harm human health and the environment. We must find better ways to meet fire safety standards by reducing and eliminating wherever possible dangerous chemicals."

In recognition of TB 117's inadequacy in addressing the flammability performance of upholstery cover fabric and its interactions with underlying filling materials and the health concerns over the use of these chemicals, the bureau published TB 117-2013 to allow for a smolder standard that does not require the use of flame retardant chemicals to be in compliance. TB117-2013 supersedes TB 117.

The updated method changes from the open flame method of testing to a smoldering test. These test methods consist of four tests used to evaluate the cigarette ignition resistance of upholstery cover fabrics, barrier (interliner) materials, resilient filling materials, and decking materials (used for support under loose seat cushions) used in the manufacture of upholstered furniture.

Flame-Retardant Chemicals & Public Health Hazards

Manufacturers of consumer products commonly add flame-retardant chemicals to plastics and other flammable materials to reduce the risk of fire. These chemicals are released into the environment during manufacture, use, and disposal of products containing flame retardants.

PCBs The earliest flame retardants, polychlorinated biphenyls (PCBs) were banned in the United States in 1977 when it was determined that they are toxic. With the ban, industries shifted to using brominated flame retardants.

PBDEs The most studied of the brominated flame retardants are the polybrominated diphenyl ethers (PBDEs), which were first introduced into the market over thirty years ago. PBDEs are closely related in structure and behavior of PCBs.

Because of PCBs' known neurotoxic and carcinogenic effects and the similarity of the chemicals' molecular structures, concerns were raised about potential biological hazards of PBDEs.

Studies in laboratory animals and humans have linked PBDEs to thyroid disruption, memory and learning problems, delayed mental and physical development, lower IQ, advanced puberty, and reduced fertility.

A 2009 *in vivo* animal study conducted by the United States Environmental Protection Agency (US EPA) noted that PBDEs are particularly toxic to the developing brains of animals. Peer-reviewed studies have shown that even a single dose administered to mice during development of the brain can cause permanent

changes in behavior, including hyperactivity.

A 1998 study in Sweden found the first evidence of potential for breast milk contamination from PBDEs. In the Swedish study, archived samples collected between 1972 and 1997 were analyzed for the presence of PBDEs to get an overall summed total of PBDEs in milk. The data from Sweden show a drastic increase in the quantity of PBDEs detected in women's breast milk from 1972 to 1997, with concentrations doubling every five years.

Sweden's voluntary phase-out of PBDEs by companies and branches of the government began as early as 1990, and the Swedish government strongly encouraged the European Union to ban PBDEs outright.

A striking response to Sweden's voluntary PBDE controls can be seen after 1997. Total PBDE levels in Swedish women's breast milk fell about 30% between 1997 and 2000.

The European Union has banned several types of PBDEs as of 2008, 10 years after the Swedish discovered that they were accumulating in breast milk.

Sweden is the only nation with a comprehensive breast milk monitoring program, so it has been difficult to track PBDE concentration trends elsewhere. However, in regions where bans and restrictions have not been established, available studies are showing that PBDE concentrations in breast milk have risen far past Sweden's 1997 peak.

The highest recorded PBDE levels in humans to date have been in the United States.

A 2002 study of PBDEs in San Francisco Bay Area women's breast fat reported an average of 86 ng/g fat, which is 21.5 times higher than Sweden's 1997 peak.

Studies of PBDEs in maternal blood and milk in Texas and Indiana from 2001 and 2002 reported levels similar to those found in the San Francisco Bay Area.

Average PBDE levels in Japanese women's breast milk are comparable with those found in Sweden and other parts of Europe, and levels in Canada were recently found to be 25.4 ng/g fat.

The United States has average PBDE levels about 3 times higher than those found in Canada, and more than 100 times higher than those measured in Japan.

In 2003, concerned about the hazards posed by two types of PBDEs, especially to breast-fed infants, the California Legislature passed, and the Governor enacted, a ban on these chemicals (AB 302 (Chan) Chapter 205, Statutes of 2003).

Chlorinated Tris Chlorinated Tris (TDCPP) has been in use since the 1960s. TDCPP

was banned from use in children's pajamas in 1977 when it was found to be mutagenic, but remains in use as a foam additive in furniture, car seats, and other products.

Its use has increased in the United States following the 2006 ban on the common flame retardant PentaPBDE.

According to studies conducted in rats, TDCPP is associated with increased tumor rates in kidneys and testes, some of which were cancerous.

Evidence suggests that it may impact fertility by influencing hormone levels and semen quality in men. A recently published study found that TDCPP was a neurotoxin to brain cells. In an assessment conducted by the Consumer Product and Safety Commission, TDCPP was found to pose a threat to human health.

Pursuant to Proposition 65, the State of California has listed TDCPP as a chemical known to cause cancer.

On March 13, 2014, DTSC named TDCPP in children's foam padded sleep products as a priority product to be evaluated in the Safer Consumer Products Program for potential regulatory action.

Because of molecular similarity, other flame retardants are similarly linked to cancer and other above-listed adverse health effects.

Additionally, many flame retardants degrade into compounds that are also toxic, and in some cases the degradation products may be the primary toxic agent. Halogenated compounds with aromatic rings can degrade into dioxins and dioxin-like compounds, particularly when heated, such as during production, a fire, recycling, or exposure to sun. Chlorinated dioxins are among the highly toxic compounds listed by the Stockholm Convention on Persistent Organic Pollutants.

Exposure Pathways

Nearly all Americans tested now have flame retardants in their body.

Residents in North America tend to have substantially higher body levels of flame retardants than people who live in many other developed areas; and around the world, human body levels of flame retardants have increased over the last 30 years.

People can be exposed to flame retardants through several routes, including diet; inhalation of dust from consumer products in the home, vehicle, or workplace; or environmental contamination near their home or workplace.

Infants and toddlers are particularly exposed to flame retardants found in breast milk and dust. Because many halogenated flame retardants are fat-soluble, they accumulate in fatty areas such as breast tissue and are mobilized into breast milk, delivering high levels of flame retardants to breast-feeding infants.

As consumer products age, small particles of material become dust particles in the air and land on surfaces around the home, including the floor. Young children crawling and playing on the floor frequently bring their hands to their mouths, ingesting about twice as much house dust as adults per day in the United States. Young children in the United States tend to carry higher levels of flame retardants per unit body weight than do adults.

Some occupations expose workers to higher levels of halogenated flame retardants and their degradation products.

Studies have shown U.S. foam recyclers and carpet installers, who handle padding often made from recycled polyurethane foam, showed elevated levels of flame retardants in their tissues. Workers in electronics recycling plants around the world also have elevated body levels of flame retardants relative to the general population. Electronics recyclers in Guiyu, China, have some of the highest human body levels of PBDEs in the world.

U.S. firefighters also show elevated levels of PBDEs and high levels of brominated furans, toxic degradation products of brominated flame retardants.

Environmental Exposure

Flame retardants manufactured for use in consumer products are found in various environments around the world.

In 2009, the U.S. National Oceanic and Atmospheric Administration released a report on PBDEs and found that, in contrast to earlier reports, they were discovered throughout the U.S. coastal zone. This nationwide survey found that New York's Hudson Raritan Estuary had the highest overall concentrations of PBDEs, both in sediments and shellfish.

Individual sites with the highest PBDE measurements were found in shellfish taken from Anaheim Bay, California, and four sites in the Hudson Raritan Estuary.

Watersheds that include the Southern California Bight, Puget Sound, the central and eastern Gulf of Mexico off the Tampa-St. Petersburg, Florida coast, and Lake Michigan waters near Chicago and Gary, Indiana also were found to have high PBDE concentrations.

Communities near electronics factories and disposal facilities, especially areas with little environmental oversight or control, develop high levels of flame retardants in air, soil, water, vegetation, and people.

Organophosphorus flame retardants have been detected in wastewater in Spain and Sweden, and some compounds do not appear to be removed thoroughly during water treatment.

Conclusion

Because of the noted environmental and potential adverse health effects of the variety of flame retardant chemicals used in commerce today, the United States government, state governments and international governments have taken action to investigate, regulate or ban their use.